Localized phase retrieval algorithm for oversampled intensity measurements

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We present an algorithm for phase retrieval from oversampled intensity measurements in 2D. In particular we consider the case of oversampling by factor of 2 in each dimension. We use the relations between Fourier modes that result from the Nyquist-Shannon sampling theorem to establish a system of equations that can be solved approximately by taking only a few terms in an expansion of the support window. Within this approximation we introduce a method for phase retrieval that consists of two stages: In the first one, a few of the phases in a localized region in reciprocal space are obtained. These phases are then used to obtain the rest of the unknown phases by means of a simple propagation method on the second stage. We present an example in which we use a downhill minimization method to solve the system of non-linear equations that arises on the first stage.